



TREE AND SHRUB BIOMASS ESTIMATES FOR MICHIGAN, 1980

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ABSTRACT.—Live tree biomass estimates in green tons and shrub biomass estimates in pounds per acre are presented for Michigan.

KEY WORDS: Tree weights, tops and limbs, tall shrubs, low shrubs.

TREE BIOMASS

In recent years, increasing removal and processing costs, new product development, increasing competition for wood, and the energy crisis have challenged the tradition of using only the merchantable tree bole.¹ Complete above-ground tree utilization requires a measure of tree volume that includes more than just merchantable volume. In Michigan, estimates of tree biomass on commercial forest land were made during the recent fourth forest inventory.

Method

Tree biomass was estimated by the following method: First, net cubic foot volumes were converted to green tons by using weight conversion factors for each species (Markwardt 1930). The weight of the bole bark was then computed using bark correction factors for individual species, the gross volume of the bole, and an average bark weight of 37 pounds per cubic foot. Tops and limbs for growing-stock and cull trees were estimated as 45 percent of the gross bole volume (Young *et al.* 1976). Finally, the biomass for

trees less than 5 inches d.b.h. was computed from a regression equation fit to Young's tree weight table (Young *et al.* 1976). This regression equation uses d.b.h. to estimate total above-ground biomass as 80 percent of the above- and below-ground biomass.

Findings

Tree biomass, including the bark, is made up of five components (table 1). The largest portion of the

TABLE 1.—*Distribution of tree biomass on commercial forest land among tree components, Michigan, 1980*

Tree component	Biomass	
	Million green tons	Percent
1. 1- to 5-inch diameter breast high trees	193.7	18
2. Growing stock		
A. boles—from a 1-foot stump to a variable 4-inch top diameter outside the bark.	530.9	51
B. tree tops and limbs—the volume above the variable 4-inch top, excluding the foliage.	247.6	24
3. Cull		
A. boles—from a 1-foot stump to a variable 4-inch top diameter outside the back.	44.7	4
B. tree tops and limbs—the volume above the variable 4-inch top, excluding the foliage	29.6	3
All Components	1,046.5	

¹The above-ground volume in growing-stock trees from a 1-foot stump to a variable 4-inch top diameter outside the bark that meets pulpwood specifications.

State's tree biomass, more than 50 percent, is in growing-stock boles. This is followed by growing-stock tops and limbs that provide an additional 24 percent of the total tree biomass.

Total tree biomass in the State amounted to more than 1 billion green tons or 46 billion cubic feet (table 2). Tree biomass in growing-stock boles, the tree component used in most inventories for volume, equaled 531 million green tons (table 3).

Hardwood tree species make up 75 percent of Michigan's tree biomass. Of the 781 million green tons of hardwood biomass, 170 million tons are in hard maple species and 130 tons are in aspen. Also shown in the following tabulation is softwood tree biomass concentrated in the pines, northern white-cedar, and balsam fir:

Species group

Tree biomass (Million green tons)

Other hardwoods	197.9
Hard maple	170.3
Aspen	129.6
Soft maple	124.1
Oak	117.3
Pine	87.5
Other softwoods	67.8
Northern white-cedar	58.6
Balsam fir	51.1
Paper birch	42.3
All species	1,046.5

SHRUB BIOMASS

The biomass of other woody perennials (all shrubs) on Michigan's commercial forest land was also estimated in conjunction with the recent forest inventory.

Table 2.--All live tree biomass on commercial forest land by species group and forest type, Michigan, 1980

(In green tons)

Species group	Forest type							
	All types	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar
SOFTWOODS								
White pine	20,468,311	566,804	1,245,668	6,238,347	990,056	238,250	662,120	1,274,799
Red pine	33,041,982	2,510,576	23,650,975	1,026,052	167,054	68,418	280,873	70,244
Jack pine	33,963,901	25,114,823	3,037,295	215,878	49,122	45,076	927,107	--
White spruce	14,149,758	18,787	109,348	311,329	3,828,580	2,010,639	194,002	1,326,903
Black spruce	17,514,624	529,279	102,968	264,531	1,425,072	103,815	9,553,498	3,581,080
Balsam fir	51,103,647	44,687	213,928	725,983	13,125,533	611,607	1,651,460	8,917,489
Hemlock	24,730,688	--	68,955	105,130	481,796	7,844	111,946	745,739
Tamarack	6,954,471	8,083	11,059	25,916	305,818	27,181	965,050	2,317,387
Northern white-cedar	58,566,961	3,319	55,447	111,826	2,555,680	438,206	1,400,752	40,152,115
Other softwoods	4,544,431	--	177,211	356,765	3,036	146,032	2,834	91,066
Total	265,038,774	28,796,358	28,672,854	9,381,757	22,931,747	3,697,068	15,749,642	58,476,822
HARDWOODS								
Select white oaks	34,207,991	170,517	507,217	241,983	--	--	--	--
Select red oaks	65,860,332	2,052,724	902,388	458,867	26,720	--	--	--
Other red oaks	17,196,503	779,808	727,965	--	--	--	--	--
Hickory	6,446,123	16,357	28,639	--	--	--	--	--
Yellow birch	32,067,348	--	--	30,736	913,980	20,610	129,034	1,064,956
Hard maple	170,281,365	34,032	218,821	257,883	561,506	82,027	46,616	336,356
Soft maple	124,063,072	456,822	741,072	723,715	2,663,631	196,829	528,002	2,791,939
Beech	20,513,346	--	26,491	48,023	13,824	14,389	--	--
Ash	41,988,244	--	34,607	23,280	481,930	7,244	102,451	2,635,326
Balsam poplar	10,808,208	--	3,690	15,489	558,276	104,662	90,339	1,250,182
Cottonwood	3,235,916	--	--	--	--	--	--	--
Bigtooth aspen	42,644,753	240,833	646,207	168,764	114,165	8,158	74,959	219,519
Quaking aspen	86,950,725	776,862	1,163,902	744,595	3,055,704	864,176	1,236,931	1,551,461
Basswood	27,394,152	23,056	26,847	7,431	15,043	3,421	--	83,424
Yellow-poplar	698,427	--	11,603	--	--	--	--	--
Black walnut	1,423,274	--	9,766	--	--	--	--	--
Black cherry	18,504,249	89,320	233,203	83,624	279,527	61,317	32,176	39,879
Butternut	288,868	16,485	--	--	--	--	--	14,570
Elm	18,188,254	14,966	--	14,869	278,377	19,530	19,582	163,193
Paper birch	42,268,071	194,107	264,961	766,856	2,572,795	162,724	770,213	5,413,820
Other hardwoods	6,560,371	8,010	23,909	--	461	10,179	--	22,341
Noncommercial species	9,860,846	10,859	33,577	1,206	42,685	1,047	67,180	94,855
Total	781,450,438	4,884,758	5,604,865	3,587,321	11,578,624	1,556,313	3,097,483	15,681,821
All species	1,046,489,212	33,681,116	34,277,719	12,969,078	34,510,371	5,253,381	18,847,125	74,158,643

(Table 2 continued on next page)

(Table 2 continued)

Species group	Forest type							
	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-birch	Aspen	Paper birch	Exotic	Non-stocked
SOFTWOODS								
White pine	57,392	1,327,649	631,372	4,621,039	2,241,148	278,665	57,385	37,617
Red pine	8,118	1,466,671	100,688	1,020,463	2,179,091	190,706	276,479	25,574
Jack pine	24,027	2,294,105	13,627	673,384	1,339,977	131,598	63,207	34,675
White spruce	2,699	65,857	485,968	2,828,900	2,494,486	453,627	17,682	951
Black spruce	370,831	16,446	266,979	459,960	684,670	122,375	--	33,120
Balsam fir	211,941	107,725	2,552,836	10,920,373	9,994,960	2,012,649	--	12,476
Hemlock	--	52,777	1,086,339	21,232,880	629,940	206,995	--	347
Tamarack	2,466,923	3,760	297,875	109,849	298,550	97,771	--	19,249
Northern white-cedar	314,547	13,237	3,027,461	5,090,573	4,142,259	1,252,648	2,689	6,202
Other softwoods	--	98,451	22,667	611,613	63,605	--	2,968,118	3,033
Total	3,456,478	5,446,678	8,485,812	47,569,034	24,068,686	4,747,034	3,385,560	173,244
HARDWOODS								
Select white oaks	--	26,360,894	1,435,265	3,933,273	1,486,334	47,930	24,578	--
Select red oaks	--	41,514,049	708,074	12,290,501	7,326,008	485,426	87,664	7,911
Other red oaks	--	14,118,068	204,650	861,195	479,157	--	25,660	--
Hickory	--	3,863,219	188,585	2,313,701	26,820	8,802	--	--
Yellow birch	--	72,107	2,046,344	26,936,066	647,613	199,971	5,931	--
Hard maple	--	971,796	1,289,447	160,258,290	4,967,813	1,165,616	60,365	30,797
Soft maple	48,960	7,594,058	23,830,726	65,824,176	16,215,031	2,404,362	16,524	27,225
Beech	--	240,878	168,496	19,439,291	469,088	91,603	--	1,263
Ash	17,611	1,534,198	14,929,497	18,395,634	3,307,367	480,131	3,817	35,151
Balsam poplar	36,081	22,590	730,414	743,506	6,914,212	270,613	56,773	11,381
Cottonwood	--	273,204	1,553,423	942,320	466,969	--	--	--
Bigtooth aspen	--	5,132,973	356,298	7,275,340	27,781,141	551,806	57,125	17,465
Quaking aspen	73,809	1,534,782	2,802,951	15,928,075	55,222,380	1,780,801	166,435	47,861
Basswood	--	452,735	1,142,238	24,403,823	991,579	228,835	15,720	--
Yellow-poplar	--	87,092	65,748	533,984	--	--	--	--
Black walnut	--	980,731	154,067	278,710	--	--	--	--
Black cherry	--	2,439,030	988,944	11,916,816	2,089,577	79,554	59,316	111,966
Butternut	--	108,586	70,794	78,433	--	--	--	--
Elm	--	496,708	3,883,951	11,781,002	1,389,893	73,618	5,341	47,224
Paper birch	93,647	758,212	1,967,536	7,825,617	10,871,000	10,584,111	--	22,472
Other hardwoods	--	1,047,225	2,146,275	3,004,686	254,044	9,779	33,462	--
Noncommercial species	--	727,334	734,429	7,043,385	893,034	144,799	7,245	59,211
Total	270,108	110,330,469	61,398,152	402,007,824	141,799,060	18,607,757	625,956	419,927
All species	3,726,586	115,777,147	69,883,964	449,576,858	165,867,746	23,354,791	4,011,516	593,171

To facilitate sampling, shrub species were placed into two arbitrary categories, tall and low shrubs. For tall shrubs and trees less than 1.0 d.b.h., the stem diameters by species were measured. This vegetation layer is important in the production of woody winter feed (browse) for wildlife. The low shrub group or ground cover species, considered less important as browse, were sampled by making visual estimates of percent cover. Biomass estimates in weight per acre are shown in table 4.

Method

Stem diameters were measured 6 inches above ground level for all tall shrubs and for tree species less than 1.0 inch d.b.h. For low shrubs, a visual estimate of percent ground cover was made by species.

Biomass prediction equations that have been developed (Telfer 1969, Grigal and Ohmann 1977, Ohmann *et al.* 1976, Brown 1976, Roussopoulos and Loomis 1979, Ohmann *et al.* 1981) were applied to

the shrub and small tree species. From these equations, total plant biomass (green weight) was calculated by species, using either stem diameter (tall shrubs) or percent ground cover (low shrubs) as a variable.

Findings

Shrub biomass was highest in the tamarack forest type where it totaled 2.3 tons per acre. Other forest types with significant amounts of shrub volume are listed below:

Forest type	Low and tall shrub biomass (Green tons per acre)
Tamarack	2.3
Black spruce	1.6
Balsam fir	1.4
Elm-ash-soft maple	1.1
Northern white-cedar	.9

The tabulation below shows those shrub species that have significant above-ground biomass per acre weights within each group by forest type:

Table 3.--All live tree biomass by species group and tree biomass component, Michigan, 1980

(In green tons)

Species group	All components	1- to 5-inch trees	Biomass component			
			Growing stock		Cull	
			Boles	Tops and limbs	Boles	Tops and limbs
SOFTWOODS						
White pine	20,468,311	2,040,428	12,189,288	5,517,596	429,076	291,923
Red pine	33,041,982	6,003,291	18,273,921	8,463,173	185,544	116,053
Jack pine	33,963,901	6,053,240	18,447,271	8,324,038	691,748	447,604
White spruce	14,149,758	2,226,721	7,919,098	3,747,674	156,194	100,071
Black spruce	17,514,624	8,013,947	6,387,658	3,002,748	61,356	48,915
Balsam fir	51,103,647	21,193,910	19,971,004	9,250,908	393,271	294,554
Hemlock	24,730,688	1,754,291	14,401,939	6,585,497	1,218,319	770,642
Tamarack	6,954,471	2,557,909	2,772,757	1,362,239	132,205	129,361
Northern white-cedar	58,566,961	21,278,584	21,530,000	10,454,389	2,924,482	2,379,506
Other softwoods	4,544,431	2,103,424	1,449,494	648,356	214,297	128,860
Total	265,038,774	73,225,745	123,342,430	57,356,618	6,406,492	4,707,489
HARDWOODS						
Select white oaks	34,207,991	2,583,066	20,270,584	9,434,816	1,215,413	704,112
Select red oaks	65,860,332	2,836,535	41,209,572	18,693,029	1,946,629	1,174,567
Other red oaks	17,196,503	771,423	10,465,449	4,716,395	782,621	460,615
Hickory	6,446,123	583,336	3,852,494	1,831,545	114,735	64,013
Yellow birch	32,067,348	3,087,632	15,100,270	7,258,876	3,749,416	2,871,154
Hard maple	170,281,365	30,609,600	87,477,220	40,693,732	7,030,385	4,470,428
Soft maple	124,063,072	23,312,870	62,142,272	29,705,963	5,358,206	3,543,761
Beech	20,513,346	1,720,044	10,288,958	4,990,610	2,115,726	1,398,008
Ash	41,988,244	11,176,241	19,857,082	9,047,810	1,169,084	738,027
Balsam poplar	10,808,208	1,493,468	5,947,443	2,809,185	325,097	233,015
Cottonwood	3,235,916	168,491	2,001,614	981,077	40,055	44,679
Bigtooth aspen	42,644,753	5,267,931	23,766,408	11,033,490	1,525,170	1,051,754
Quaking aspen	86,950,725	13,950,017	43,874,360	20,772,083	4,876,787	3,477,478
Basswood	27,394,152	1,729,817	16,888,735	7,432,664	826,876	516,060
Yellow-poplar	698,427	34,677	456,065	207,685	--	--
Black walnut	1,423,274	42,261	905,291	421,608	35,979	18,135
Black cherry	18,504,249	3,337,485	8,736,663	3,937,813	1,576,911	915,377
Butternut	288,868	83,219	102,681	48,257	34,490	20,221
Elm	18,188,254	4,186,989	8,691,081	4,084,645	781,728	443,811
Paper birch	42,268,071	5,612,788	22,909,959	10,888,803	1,752,869	1,103,652
Other hardwoods	6,560,371	1,797,298	2,604,921	1,259,784	540,835	357,533
Noncommercial species	9,860,846	6,100,943	--	--	2,458,082	1,301,821
Total	781,450,438	120,486,131	407,549,122	190,249,870	38,257,094	24,908,221
All species	1,046,489,212	193,711,876	530,891,552	247,606,488	44,663,586	29,615,710

Tall shrub species and trees less than 1.0 inch d.b.h.		Shrub biomass (Green pounds per acre)
Forest type		
Speckled alder	Tamarack	2,607
Speckled alder	Black spruce	1,703
Speckled alder	Balsam fir	644
Speckled alder	Elm-ash-soft maple	607
Balsam fir	Balsam fir	587
Low shrub species		
Blueberry	Jack pine	459
Leatherleaf	Tamarack	321
Labrador tea	Black spruce	218
Leatherleaf	Black spruce	158
Blueberry	Red pine	157

white-cedar, paper birch, and white pine forest types. The following tabulation shows both tree and shrub biomass estimates in pounds per acre by forest type:

Forest type	Tall shrubs	Low shrubs	Trees
	(Green pounds per acre)		
Jack pine	620	591	80,509
Red pine	474	213	104,521
White pine	887	284	121,150
Balsam fir	2,534	196	108,626
White spruce	1,302	51	104,963
Black spruce	2,717	533	72,405
Northern white-cedar	1,827	44	126,378
Tamarack	4,109	424	64,923
Oak-hickory	1,117	198	130,556
Elm-ash-soft maple	2,124	120	105,374
Maple-birch	1,266	51	147,440
Aspen	1,559	112	97,380
Paper birch	1,624	131	124,625
Exotic	277	107	92,967
Nonstocked	508	139	6,889

TOTAL ABOVE-GROUND BIOMASS

The highest estimates of total biomass per acre are found in the maple-birch, oak-hickory, northern

Table 4.--All live shrub^{1/} biomass yields on commercial forest land by shrub species group and forest type, Michigan, 1980

(In pounds per acre)

Shrub species group	Forest type														
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-birch	Aspen	Paper birch	Exotic	Non-stocked
TALL SHRUBS															
Balsam fir	4	27	125	587	66	181	317	145	10	72	71	125	285	--	--
Tamarack	--	--	--	14	13	10	8	81	--	2	--	1	15	--	--
White spruce	--	--	--	48	43	--	13	--	2	4	4	5	35	--	--
Black spruce	17	7	3	71	--	476	46	167	--	4	--	2	1	--	--
Jack pine	199	6	--	--	--	--	--	--	26	--	--	3	--	--	4
Red pine	8	27	--	--	--	--	--	--	3	--	1	--	--	--	--
White pine	13	22	122	7	--	1	--	6	34	--	2	6	14	--	--
Scotch pine	--	--	--	--	--	--	--	--	--	--	--	--	--	94	--
Northern white-cedar	--	--	--	306	7	9	315	22	--	15	16	15	27	--	--
Hemlock	--	--	--	8	--	--	--	--	--	5	11	--	1	--	--
Boxelder	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--
Striped maple	--	--	--	--	--	--	--	--	--	--	5	1	3	--	--
Red maple	11	48	55	37	153	29	56	29	85	109	102	143	53	3	--
Silver maple	--	--	--	--	--	--	--	--	1	10	--	3	--	--	--
Sugar maple	--	15	68	29	55	52	9	--	8	25	480	39	22	--	--
Mountain maple	--	--	--	103	86	--	32	2	--	76	32	21	145	--	--
Red alder	--	--	7	--	--	--	--	--	--	--	--	3	--	--	--
Green alder	34	--	--	--	--	40	--	--	3	--	--	1	44	--	--
Speckled alder	71	24	118	644	260	1,703	433	2,607	13	607	35	134	283	--	369
Yellow birch	--	--	--	5	--	--	--	--	--	5	15	3	--	16	--
Paper birch	1	--	1	10	31	--	6	--	--	8	6	7	12	--	--
Swamp birch	--	--	--	--	--	11	--	--	--	--	--	--	--	--	--
American hornbeam	--	30	--	--	--	--	--	--	5	11	6	1	1	--	--
Dogwood	1	1	93	68	15	49	110	38	45	219	27	126	200	1	36
Flowering dogwood	--	--	--	--	--	3	--	--	4	--	1	--	--	--	--
Hawthorn	6	21	--	--	--	--	--	--	8	3	2	3	--	--	46
Beech	--	6	--	--	--	--	--	--	1	2	24	2	--	--	--
White ash	--	2	--	--	1	--	--	--	22	21	20	25	16	1	--
Black ash	--	--	--	28	1	--	96	1	--	155	9	21	7	--	--
Green ash	--	--	--	--	--	--	10	--	1	45	4	11	2	--	--
Black alder	--	--	--	--	--	--	53	8	--	32	3	1	--	--	--
Mountain holly	--	--	--	--	--	4	--	--	--	16	--	--	1	--	--
Spice bush	--	--	--	--	--	--	--	--	--	26	8	--	--	--	--
Apple	--	--	--	--	--	--	--	--	3	--	1	--	--	--	--
Eastern hophornbeam	--	--	8	--	--	--	--	--	14	--	45	21	1	21	--
Balsam poplar	--	--	--	31	18	--	20	--	--	6	1	18	10	--	--
Bigtooth aspen	1	10	--	--	--	--	--	--	7	--	2	62	53	17	--
Quaking aspen	4	27	1	3	--	4	7	5	7	21	27	213	53	20	--
Pincherry	12	--	--	--	8	--	--	--	5	1	1	3	--	--	1
Black cherry	27	36	30	21	16	8	2	--	149	66	51	68	18	40	1
Chokecherry	6	2	5	5	83	6	4	17	13	17	9	32	7	4	1
Sandcherry	1	--	--	--	--	--	--	--	--	--	--	--	--	--	16
Pawpaw	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
White oak	6	1	13	--	--	--	--	--	67	1	4	5	--	1	--
Northern pin oak	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Northern red oak	62	35	4	--	--	--	--	--	164	4	13	32	13	12	2
Black oak	8	--	--	--	--	--	--	--	25	--	--	2	--	--	--
Sweet gale	--	--	--	34	--	--	4	--	--	22	--	--	--	--	--

(Table 4 continued on next page)

(Table 4 continued)

Shrub species group	Forest type														
	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar	Tamarack	Oak-hickory	Elm-ash-soft maple	Maple-birch	Aspen	Paper birch	Exotic	Non-stocked
Mountain ash	--	--	--	--	--	6	9	--	--	2	2	2	--	--	--
Witch hazel	--	--	18	10	7	11	--	--	38	11	11	45	12	--	--
Juneberry	25	11	109	25	82	12	18	391	18	18	16	49	38	1	7
Hazel	--	20	106	88	111	--	162	45	21	86	113	115	48	--	--
Prickly ash	--	--	--	--	--	--	--	--	64	12	3	--	--	--	--
Alder buckthorn	--	--	--	--	--	--	4	--	--	3	--	--	--	--	--
Leatherwood	--	--	--	--	--	--	--	--	--	--	2	1	--	--	--
Viburnum	34	27	--	239	--	98	47	137	189	192	21	99	56	--	--
Elder	--	6	--	--	--	--	2	--	2	18	11	2	--	--	1
Sumac	--	38	--	--	--	--	1	--	10	7	7	18	--	4	4
Buffaloberry	--	--	--	3	--	--	--	--	--	--	--	1	--	--	--
Buttonbush	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--
Willow	57	23	1	105	246	4	43	408	1	89	9	61	69	41	20
Sassafras	--	2	--	--	--	--	--	--	32	1	6	2	--	--	--
American basswood	--	--	--	--	--	--	--	--	1	4	10	2	1	--	--
American elm	12	--	--	2	--	--	--	--	4	56	15	4	78	1	--
Slippery elm	--	--	--	--	--	--	--	--	6	2	1	--	--	--	--
Rock elm	--	--	--	--	--	--	--	--	6	11	--	--	--	--	--
Total	620	474	887	2,534	1,302	2,717	1,827	4,109	1,117	2,124	1,266	1,559	1,624	277	508
LOW SHRUBS															
Common juniper	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--
Yew	--	--	--	4	1	1	2	2	--	--	3	--	--	--	--
Holly	--	--	--	--	--	--	2	--	--	1	--	--	--	--	--
Virginia creeper	--	--	--	--	--	--	--	--	--	1	--	--	1	--	--
Spirea	--	--	--	--	--	--	--	2	--	7	--	--	1	--	1
Labrador tea	13	--	23	41	12	218	9	15	--	41	--	--	--	--	--
Leatherleaf	50	--	151	67	--	158	1	321	9	19	--	17	66	--	--
Bog laurel	2	--	--	--	--	6	1	1	--	1	--	--	--	--	--
Sweetfern	48	13	1	--	5	1	--	1	18	--	2	6	--	5	7
Gooseberry-currant	--	--	--	4	--	--	2	3	1	8	--	2	1	--	26
Chokeberry	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
Raspberry-blackberry	8	31	38	26	5	9	9	29	25	22	29	39	42	102	69
Rose	--	--	--	2	--	1	--	--	2	2	1	--	--	--	--
Black huckleberry	4	--	--	--	--	--	--	--	2	--	--	--	--	--	--
Bilberry-blueberry	459	157	56	32	13	130	11	41	133	10	11	38	12	--	35
Bush honeysuckle	--	4	4	3	6	--	--	3	1	1	--	2	2	--	--
Honeysuckle	--	7	1	15	8	3	5	4	3	3	5	7	4	--	--
Snowberry	--	--	--	2	1	--	--	--	--	--	--	--	--	--	--
Shrubby cinquefoil	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--
St. John's wort	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bearberry	7	1	--	--	--	2	1	--	--	1	--	--	--	--	--
Greenbriar	--	--	--	--	--	--	--	--	4	--	--	--	--	--	--
Bog rosemary	--	--	--	--	--	4	--	2	--	--	--	1	--	--	--
Grape	--	--	--	--	--	--	--	--	--	3	--	--	1	--	--
Total	591	213	284	196	51	533	44	424	198	120	51	112	131	107	139
All shrubs	1,211	687	1,171	2,730	1,353	3,250	1,871	4,533	1,315	2,244	1,317	1,671	1,755	384	647
Number of plots ^{2/}	188	107	62	90	101	115	246	28	435	325	1,883	916	108	30	37

^{1/}Trees under 1.0-inch d.b.h. are also included. Low shrub species that averaged less than 1.0 pound per acre are not included.

^{2/}Number of plots by forest type from which average yields were derived.

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